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# PATENT ABSTRACTS OF JAPAN

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(51)Int.Cl. G11B 7/135  
G11B 7/00  
G11B 7/13

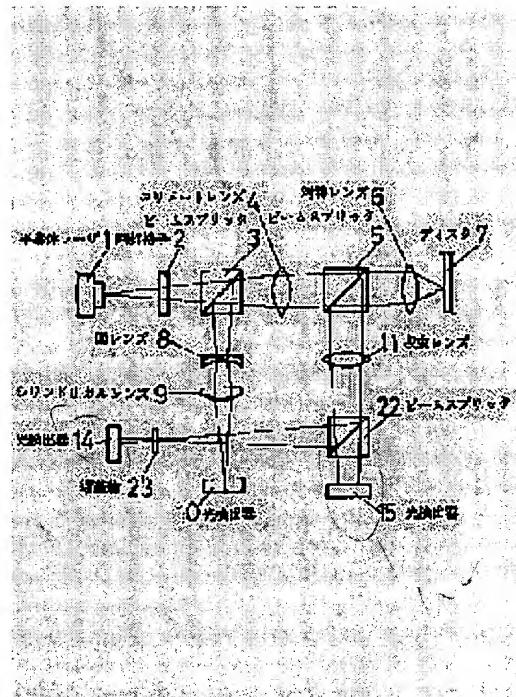
(21)Application number : 03-122925 (71)Applicant : NIPPON COLUMBIA CO LTD  
(22)Date of filing : 26.04.1991 (72)Inventor : KAWAOMO HISASHI

## (54) OPTICAL PICKUP

(57)Abstract:

**PURPOSE:** To cancel a noise component entering into a detector and to improve S/N by obtaining the information of the spot entire face of an optical disk surface and the information of the outer peripheral part of the spot to the outputs of different photodetectors.

CONSTITUTION: An outgoing beam from a semiconductor laser 1 is converged as a spot on a disk 7 through an optical system 2-6, and the reflected beam is led to the photodetector 10 through the optical system 6, 5, 4, 3, 8 and 9 and signals for focusing and tracking are detected. Further, the beam is blanched through the optical system 6, 5, 11 and 22, and one side of the blanched beam is led to the photodetector 15 and the center of the other side is shield with a shielding substance 23 placed on the focal point of a converging lens 11 and is led to the photodetector 14. Then, the output put of the photodetector 15 has the information of an entire beam spot on the disk and the output of the photodetector 14 has the information of only the outer peripheral part of the spot. Then, by obtaining the difference of both detective outputs, the output equal to an output at a reproducing time by a small beam spot effectively is obtained.



## LEGAL STATUS

[Date of request for examination]

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

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[Date of extinction of right]

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**CLAIMS**

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**[Claim(s)]**

**[Claim 1]** A branching means to branch a laser beam which irradiates a minute spot, and the reflected light from said optical disk of this laser beam on an optical disk, The 1st detector which detects the 1st reflected light which branched with this branching means, With a convergent lens as which the 2nd reflected light which branched with said branching means is completed, and the 2nd detector which detects light of the periphery section of a spot converged with this convergent lens An optical pickup characterized by obtaining a signal output using an output difference of an output of said 1st detector, and an output of said 2nd detector.

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## DETAILED DESCRIPTION

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### [Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to the optical pickup used for playback of an optical disk.

[0002]

[Description of the Prior Art] The optical pickup narrowed down the laser beam on the disk side, has acquired the signal by the reflected light, and it can play a high density record disk, so that the narrowed-down spot is small. As usually shown in property drawing showing the optical intensity distribution of drawing 3, the beam spot on a disk has a portion with strong optical reinforcement in a center section A, and the portion which becomes large [ optical reinforcement ] is in the shape of a ring partly at the periphery B. Since the beam spot will be enlarged, the light of this periphery is considered by covering the reflected light by this portion in the optical pickup of a configuration of acquiring the effect substantially reproduced by the beam spot of a small path.

[0003] The outline block diagram of the example is shown in drawing 4. In this drawing, the beam which carried out outgoing radiation from semiconductor laser 1 passes along a diffraction grating 2, a beam splitter 3, a collimate lens 4, and a beam splitter 5, and is narrowed down as the beam spot on a disk 7 with an objective lens 6. Return branching of the light reflected from the disk 7 is carried out from an objective lens 6 at a beam splitter 5, and one of these is led to a photodetector 10 via a collimate lens 4, a beam splitter 3, a concave lens 8, and a cylindrical lens 9, and detects the signal for a focus and tracking servos.

[0004] As for light, while I will accept it from a beam splitter 5 detects a RF signal with a photodetector 14 through a convergent lens 11, a mirror 12, and a pinhole 13. The pinhole 13 is put on the focus of a convergent lens 11, and since an image equivalent to a disk side arises, it is raising signal regeneration capacity by choosing the magnitude of a pinhole 13 in this location so that only a portion with the large reinforcement of the beam spot described previously may pass.

[0005]

[Problem(s) to be Solved by the Invention] However, if the aperture of said pinhole was made small in order to make the beam spot on a disk small effectually as mentioned above, in order that the quantity of light to a photodetector which carries out incidence might decrease, the electrical signal output decreased, the signal-to-noise ratio to the noise component mixed in a photodetector became small, and there was a trouble that reproducing characteristics deteriorated.

[0006]

[Means for Solving the Problem] Therefore, in this invention, as a means for improving this signal-to-noise ratio, the reflected light from a disk is branched, and a detector detects the reflected light of one of these as it is, it completes the reflected light of another side with a convergent lens, detects only light of the periphery section of that spot with other detectors, and is taken as a configuration which acquires a signal by taking both difference.

[0007]

[Function] Thereby, since the output of one detector has the information on the whole spot surface of an optical disk side and the output of the detector of another side has only the information on the spot periphery section, only the information on a spot center section is acquired by taking both difference. On the other hand, a noise component is offset by taking a difference, in order are in phase to both detectors and to mix in them.

[0008]

[Example] Drawing 1 is the outline block diagram of an optical-path system showing one example of this invention, and since the outward trip portion of optical system is the same as the conventional example, it attaches a same sign and omits explanation. Unlike the conventional example, in a return trip, a beam splitter 22 is used instead of the mirror 12 in drawing 4, and incidence of one side of the flux of light which branched here is carried out to a photodetector 15. With the shelter 23 put on the focus of a convergent lens 11, the center section is interrupted and the flux of light reflected by the beam splitter 22 reaches a photodetector 14.

[0009] By the output of the above-mentioned photodetector 15 having the information on the whole beam-spot surface on a disk, since the output of a photodetector 14 has the information only on the spot periphery section, the output of the time of reproducing by the small beam spot effectually and equivalence is obtained by taking both difference. Drawing 2 (a) is the outline block diagram of an optical-path system showing other examples, and the flux of light reflected by the mirror 12 is detected in this example by the photodetector 24 arranged at the focus of a convergent lens 11.

[0010] Since the photodetector 24 has the insensitive part which is not sensed to an optical input like drawing 2 (b) by part for

the core, it has the same effect as having arranged the shelter 23 in the example of drawing 1 . Therefore, the output of a photodetector 24 serves as information on the periphery section of the disk top beam spot. On the other hand, since the photodetector 10 for servo signal detection has the information on the whole beam-spot surface on a disk, it becomes the signal output and equivalence which were effectually reproduced at the small spot by taking both difference.

[0011]

[Effect of the Invention] Above, according to this invention, the noise component mixed in a detector is canceled and the pickup which was excellent in the signal-to-noise ratio can be obtained.

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PRIOR ART

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**EFFECT OF THE INVENTION**

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**TECHNICAL PROBLEM**

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**MEANS**

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[Means for Solving the Problem] Therefore, in this invention, as a means for improving this signal-to-noise ratio, the reflected light from a disk is branched, and a detector detects the reflected light of one of these as it is, it completes the reflected light of another side with a convergent lens, detects only light of the periphery section of that spot with other detectors, and is taken as a configuration which acquires a signal by taking both difference.

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**OPERATION**

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EXAMPLE

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## DESCRIPTION OF DRAWINGS

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[Brief Description of the Drawings]

[Drawing 1] The outline block diagram showing one example of this invention.

[Drawing 2] (a) and (b) are the outline block diagram showing other examples of this invention.

[Drawing 3] It is property drawing for explaining the optical intensity distribution by this invention.

[Drawing 4] It is the outline block diagram showing the conventional example.

[Description of Notations]

1 Semiconductor Laser

2 Diffraction Grating

3, 5, 22 Beam splitter

4 Collimate Lens

6 Objective Lens

7 Disk

8 Concave Lens

9 Cylindrical Lens

10, 14, 15, 24 Photodetector

11 Convergent Lens

12 Mirror

13 Pinhole

23 Shelter

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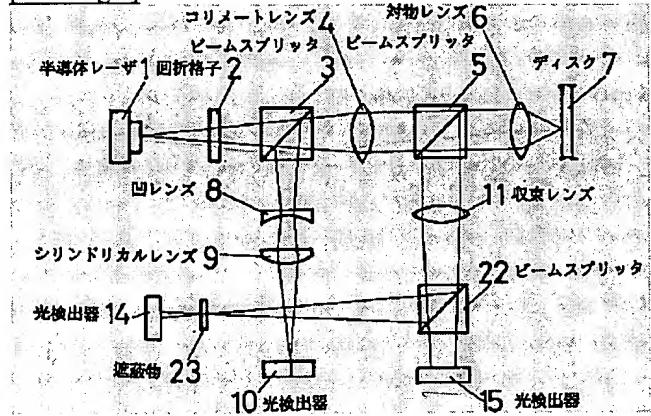
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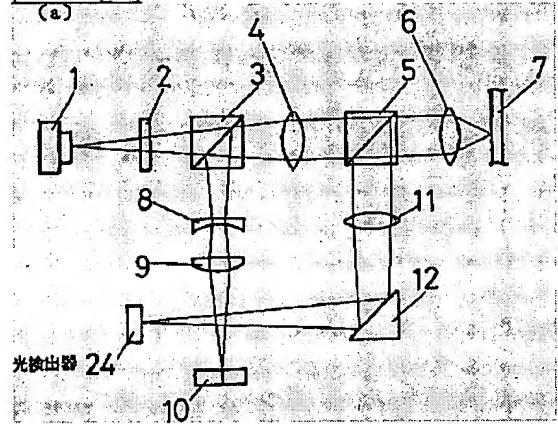
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DRAWINGS

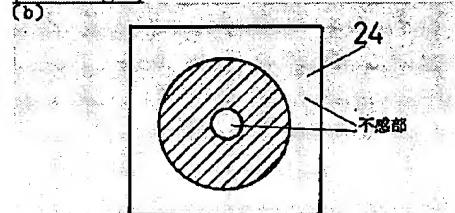
[Drawing 1]



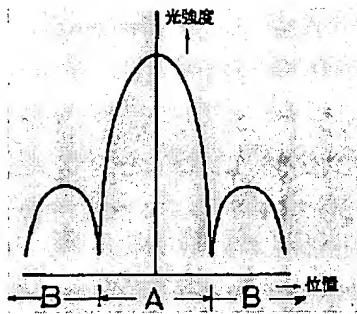
[Drawing 2]



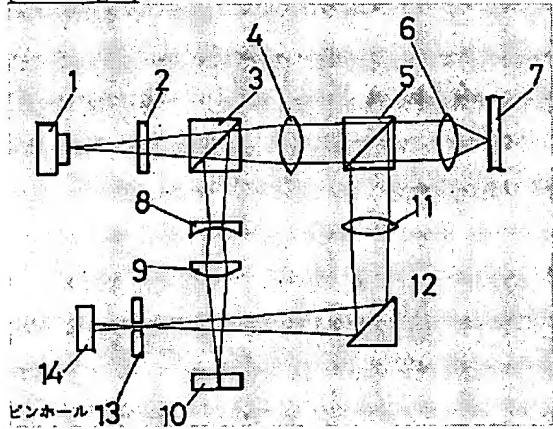
[Drawing 2]



[Drawing 3]



[Drawing 4]



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[Translation done.]

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DOCUMENT-IDENTIFIER: JP 06012697 A

TITLE: OPTICAL PICKUP

PUBN-DATE: January 21, 1994

INVENTOR-INFORMATION:

NAME

KAWAOMO, HISASHI

ASSIGNEE-INFORMATION:

NAME	COUNTRY
NIPPON COLUMBIA CO LTD	N/A

APPL-NO: JP03122925

APPL-DATE: April 26, 1991

INT-CL (IPC): G11B007/135, G11B007/00 , G11B007/13

US-CL-CURRENT: 369/44.12

ABSTRACT:

PURPOSE: To cancel a noise component entering into a detector and to improve S/N by obtaining the information of the spot entire face of an optical disk surface and the information of the outer peripheral part of the spot to the outputs of different photodetectors.

CONSTITUTION: An outgoing beam from a semiconductor laser 1 is converged as a spot on a disk 7 through an optical system 2-6, and the reflected beam is led to the photodetector 10 through the optical system 6, 5, 4, 3, 8 and 9 and signals for focusing and tracking are detected. Further, the beam is blanched through the optical system 6, 5, 11 and 22, and one side of the blanched beam

is led to the photodetector 15 and the center of the other side is shield with a shielding substance 23 placed on the focal point of a converging lens 11 and is led to the photodetector 14. Then, the output put of the photodetector 15 has the information of an entire beam spot on the disk and the output of the photodetector 14 has the information of only the outer peripheral part of the spot. Then, by obtaining the difference of both detective outputs, the output equal to an output at a reproducing time by a small beam spot effectively is obtained.

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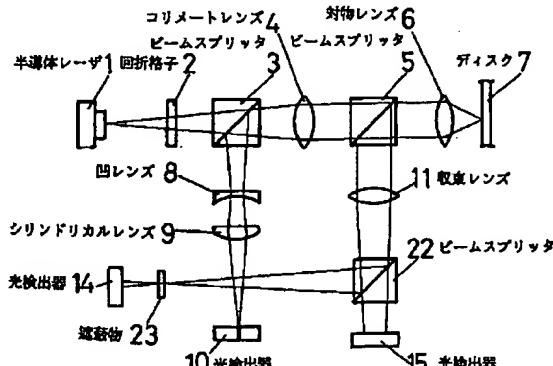
(54)【発明の名称】 光ピックアップ

(57)【要約】

【目的】 信号対雑音比の良い高密度記録ディスク再生用の光ピックアップを得ること。

【構成】 ディスクからの反射光を2分割し、その一方を第1の光検出器で受光し、他方は微小スポットに収束し、その微小スポットの外周部のエネルギーだけを第2の光検出器で受光し、第1、第2の光検出器の出力差によって信号出力を得る。

【効果】 信号成分は小さなビームスポットで検出したことと等価となり、また検出器に混入する雑音成分は相殺され、信号対雑音比の優れたピックアップとなる。



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## 【特許請求の範囲】

【請求項1】 光ディスク上に微小スポットを照射するレーザ光と、該レーザ光の前記光ディスクからの反射光を分岐する分岐手段と、該分岐手段によって分岐した第1の反射光を検出する第1の検出器と、前記分岐手段によって分岐した第2の反射光を収束させる収束レンズと、該収束レンズによって収束したスポットの外周部の光を検出する第2の検出器とによって、前記第1の検出器の出力と前記第2の検出器の出力との出力差を用いて信号出力を得ることを特徴とする光ピックアップ。

## 【発明の詳細な説明】

## 【0001】

【産業上の利用分野】 本発明は、光ディスクの再生に用いられる光ピックアップに関するものである。

## 【0002】

【従来の技術】 光ピックアップはレーザ光をディスク面上に絞り込み、その反射光により信号を得ており、その絞り込まれたスポットが小さい程、高密度記録ディスクの再生が行える。ディスク上のビームスポットは、通常、図3の光強度分布を示す特性図に示す様に、中央部Aに光強度の強い部分があり、その周辺部Bには幾つかリング状に光強度の大きくなる部分がある。この周辺部の光はビームスポットを大きくさせることになるため、この部分による反射光を遮蔽することにより、実質的に小さな径のビームスポットで再生した効果を得る構成の光ピックアップが考えられている。

【0003】 図4にその一例の概略構成図を示す。同図に於いて、半導体レーザ1より出射したビームは回折格子2、ビームスプリッタ3、コリメートレンズ4、ビームスプリッタ5を通り、対物レンズ6によりディスク7上にビームスポットとして絞り込まれる。ディスク7より反射した光は、対物レンズ6からビームスプリッタ5に戻り分岐され、その一方はコリメートレンズ4、ビームスプリッタ3、凹レンズ8、シリンドリカルレンズ9を経由して光検出器10に導かれ、フォーカス及びトラッキングサークル用の信号を検出する。

【0004】 ビームスプリッタ5からもう一方の光は、収束レンズ11、ミラー12、ピンホール13を通り光検出器14により高周波信号を検出する。ピンホール13は、収束レンズ11の焦点に置かれており、この位置では、ディスク面と等価な像が生じるため、先に述べたビームスポットの強度の大きい部分だけが通過するように、ピンホール13の大きさを選択することにより、信号再生能力を向上させている。

## 【0005】

【発明が解決しようとする課題】 しかしながら、上述のようにディスク上のビームスポットを実効的に小さくするために前記ピンホールの孔径を小さくすると、光検出器への入射する光量が減少するため、電気信号出力が減少し、光検出器に混入して来る雑音成分に対しての信号

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対雑音比が小さくなり、再生特性が劣化する問題点があった。

## 【0006】

【課題を解決するための手段】 そのため本発明では、この信号対雑音比を改善するための手段として、ディスクからの反射光を分岐させ、その一方の反射光はそのまま検出器により検出し、他方の反射光を収束レンズにより収束させ、そのスポットの外周部の光だけを他の検出器により検出し、両者の差をとることにより信号を得る構成とするものである。

## 【0007】

【作用】 これにより、一つの検出器の出力は光ディスク面のスポット全面の情報を持ち、他方の検出器の出力はスポット外周部の情報のみを持つので、両者の差をとることによりスポット中央部の情報のみが得られる。一方雑音成分は両方の検出器に同相で混入して来るため、差をとることにより相殺される。

## 【0008】

【実施例】 図1は本発明の一実施例を示す光路系の概略構成図であり、光学系の往路部分は従来例と同じなので同符号を付して説明を省略する。復路に於いては従来例と異り、図4に於けるミラー12の代りにビームスプリッタ22を用い、ここで分岐された光束の一方は光検出器15に入射する。ビームスプリッタ22により反射された光束は、収束レンズ11の焦点に置かれた遮蔽物23によってその中央部が遮られ、光検出器14に達する。

【0009】 前述の光検出器15の出力はディスク上のビームスポット全面の情報を持ち、光検出器14の出力は、スポット外周部のみの情報を持っているから、両者の差をとることにより、実効的に小さなビームスポットで再生した時と等価の出力が得られる。図2(a)は他の実施例を示す光路系の概略構成図で、この実施例ではミラー12により反射された光束は収束レンズ11の焦点に配置された光検出器24により検出される。

【0010】 光検出器24は図2(b)の如く、その中心部分で光入力に対して感じない不感部を持っているため、図1の実施例に於ける遮蔽物23を配置したのと同じ効果を有する。そのため、光検出器24の出力は、ディスク上ビームスポットの外周部の情報をとなる。一方サークル信号検出用の光検出器10は、ディスク上のビームスポット全面の情報を持っているから、両者の差をとることにより実効的に小さなスポットで再生した信号出力と等価になる。

## 【0011】

【発明の効果】 以上本発明によれば、検出器に混入して来る雑音成分はキャンセルされ、信号対雑音比の優れたピックアップを得ることが出来る。

## 【図面の簡単な説明】

50 【図1】 本発明の一実施例を示す概略構成図。

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【図2】(a), (b)は本発明の他の実施例を示す概略構成図。

【図3】本発明による光強度分布を説明するための特性図である。

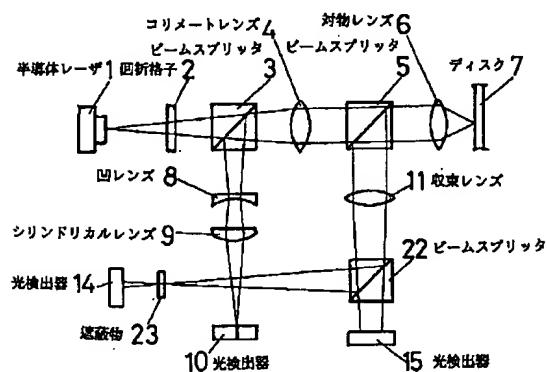
【図4】従来例を示す概略構成図である。

### 【符号の説明】

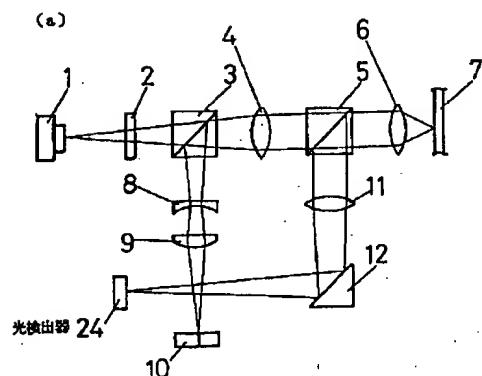
1	半導体レーザ
2	回折格子
3, 5, 22	ビームスプリッタ
4	コリミートレンズ

4  
対物レンズ  
ディスク  
凹レンズ  
シリンドリ  
光検出器  
収束レンズ  
ミラー  
ピンホール  
遮蔽物

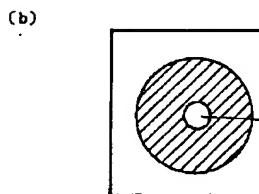
【四】



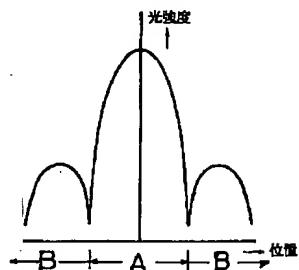
【図2】



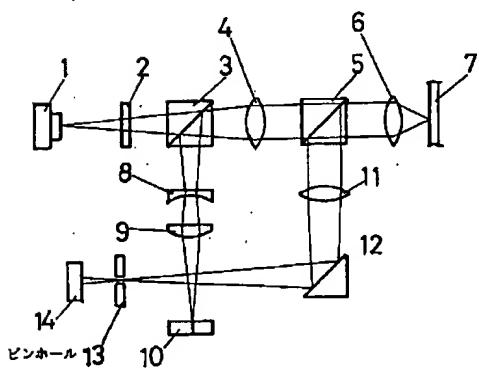
【图2】



【図3】



【図4】



## 【手続補正書】

【提出日】平成4年9月30日

## 【手続補正1】

【補正対象書類名】明細書

【補正対象項目名】発明の詳細な説明

## 【補正方法】変更

## 【補正内容】

## 【発明の詳細な説明】

## 【0001】

【産業上の利用分野】本発明は、光ディスクの再生に用いられる光ピックアップに関するものである。

## 【0002】

【従来の技術】光ピックアップはレーザ光をディスク面上に絞り込み、その反射光により信号を得ており、その絞り込まれたスポットが小さい程、高密度記録ディスクの再生が行える。ディスク上のビームスポットは、通常、図4の光強度分布を示す特性図に示す様に、中央部Aに光強度の強い部分があり、その周辺部Bには幾つかリング状に光強度の大きくなる部分がある。この周辺部の光はビームスポットを大きくさせることになるため、この部分による反射光を遮蔽することにより、実質的に小さな径のビームスポットで再生した効果を得る構成の光ピックアップが考えられている。

【0003】図5にその一例の概略構成図を示す。同図に於いて、半導体レーザ1より出射したビームは回折格子2、ビームスプリッタ3、コリメートレンズ4、ビームスプリッタ5を通り、対物レンズ6によりディスク7上にビームスポットとして絞り込まれる。ディスク7より反射した光は、対物レンズ6からビームスプリッタ5に戻り分岐され、その一方はコリメートレンズ4、ビームスプリッタ3、凹レンズ8、シリンドリカルレンズ9を経由して光検出器10に導かれ、フォーカス及びトランкиングサーボ用の信号を検出する。

【0004】ビームスプリッタ5からのもう一方の光は、収束レンズ11、ミラー12、ピンホール13を通り光検出器14により高周波信号を検出する。ピンホール13は、収束レンズ11の焦点に置かれており、この位置では、ディスク面と等価な像が生じるため、先に述べたビームスポットの強度の大きい部分だけが通過するように、ピンホール13の大きさを選択することにより、信号再生能力を向上させている。

## 【0005】

【発明が解決しようとする課題】しかしながら、上述のようにディスク上のビームスポットを実効的に小さくするため前記ピンホールの孔径を小さくすると、光検出器への入射する光量が減少するため、電気信号出力が減少し、光検出器に混入して来る雑音成分に対しての信号対雑音比が小さくなり、再生特性が劣化する問題点があった。

## 【0006】

【課題を解決するための手段】そのため本発明では、この信号対雑音比を改善するための手段として、ディスクからの反射光を分岐させ、その一方の反射光はそのまま検出器により検出し、他方の反射光を収束レンズにより収束させ、そのスポットの外周部の光だけを他の検出器により検出し、両者の差をとることにより信号を得る構成とするものである。

## 【0007】

【作用】これにより、一つの検出器の出力は光ディスク面のスポット全面の情報を持ち、他方の検出器の出力はスポット外周部の情報のみを持つこと、両者の差をとることによりスポット中央部の情報のみが得られる。一方雑音成分は両方の検出器に同相で混入して来るため、差をとることにより相殺される。

## 【0008】

【実施例】図1は本発明の一実施例を示す光路系の概略構成図であり、光学系の往路部分は従来例と同じなので同符号を付して説明を省略する。復路に於いては従来例と異り、図5に於けるミラー12の代りにビームスプリッタ22を用い、ここで分岐された光束の一方は光検出器15に入射する。ビームスプリッタ22により反射された光束は、収束レンズ11の焦点に置かれた遮蔽物23によってその中央部が遮られ、光検出器14に達する。

【0009】前述の光検出器15の出力はディスク上のビームスポット全面の情報を持ち、光検出器14の出力は、スポット外周部のみの情報を持っているから、両者の差をとることにより、実効的に小さなビームスポットで再生した時と等価の出力が得られる。図2は他の実施例を示す光路系の概略構成図で、この実施例ではミラー12により反射された光束は収束レンズ11の焦点に配置された光検出器24により検出される。

【0010】光検出器24は図3の如く、その中心部分で光入力に対して感じない不感部を持っているため、図1の実施例に於ける遮蔽物23を配置したのと同じ効果を有する。そのため、光検出器24の出力は、ディスク上ビームスポットの外周部の情報となる。一方サーボ信号検出用の光検出器10は、ディスク上のビームスポット全面の情報を持っているから、両者の差をとることにより実効的に小さなスポットで再生した信号出力と等価になる。

## 【0011】

【発明の効果】以上本発明によれば、検出器に混入して来る雑音成分はキャンセルされ、信号対雑音比の優れたピックアップを得ることが出来る。

## 【手続補正2】

【補正対象書類名】明細書

【補正対象項目名】図面の簡単な説明

【補正方法】変更

## 【補正内容】

## 【図面の簡単な説明】

【図1】本発明の一実施例を示す概略構成図。

【図2】本発明の他の実施例を示す概略構成図。

【図3】本発明の他の実施例を示す概略構成図。

【図4】本発明による光強度分布を説明するための特性図。

【図5】従来例を示す概略構成図である。

## 【符号の説明】

1	半導体レーザ
2	回折格子
3	ビームスプリッタ
4	コリメートレンズ
5	ビームスプリッタ
6	対物レンズ
7	ディスク

8	凹レンズ
9	シリンドリカルレンズ
10	光検出器
11	収束レンズ
12	ミラー
13	ピンホール
14	光検出器
15	光検出器
22	ビームスプリッタ
23	遮蔽物
24	光検出器

## 【手続補正3】

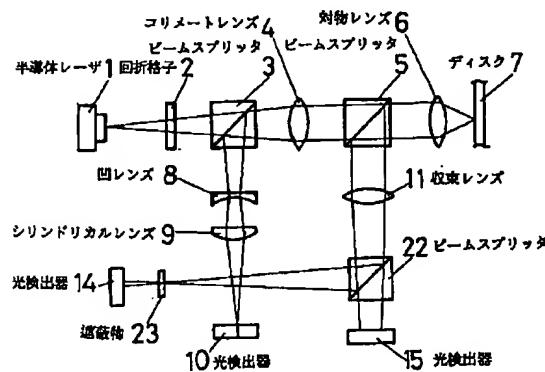
【補正対象書類名】図面

【補正対象項目名】全図

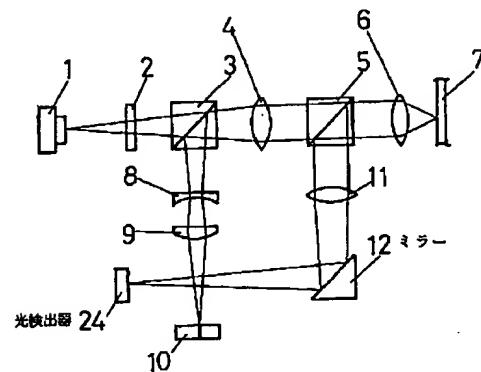
【補正方法】変更

【補正内容】

【図1】

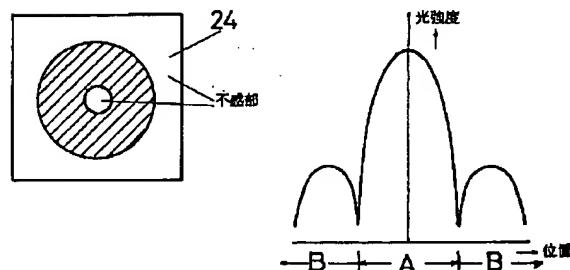


【図2】

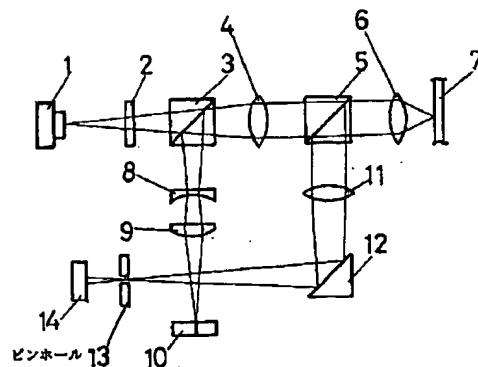


【図3】

【図4】



【図5】



## 【手続補正書】

【提出日】平成5年6月21日

## 【手続補正1】

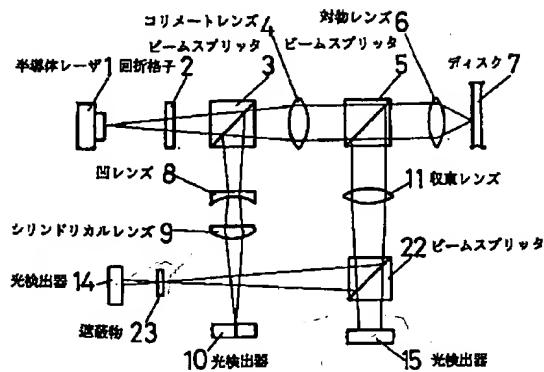
【補正対象書類名】図面

【補正対象項目名】全図

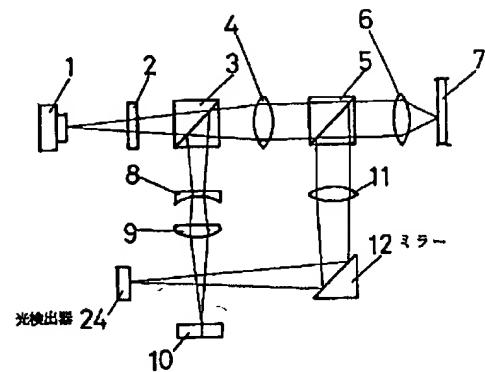
【補正方法】変更

【補正内容】

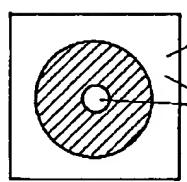
【図1】



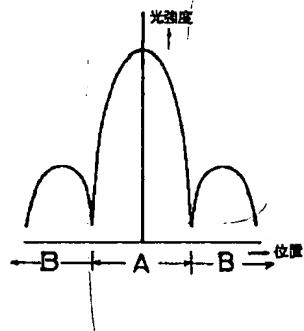
【図2】



【図3】



【図4】



【図5】

